DEVELOPING MATHEMATICA NOTEBOOKS THAT ARE EASY FOR STUDENTS TO USE

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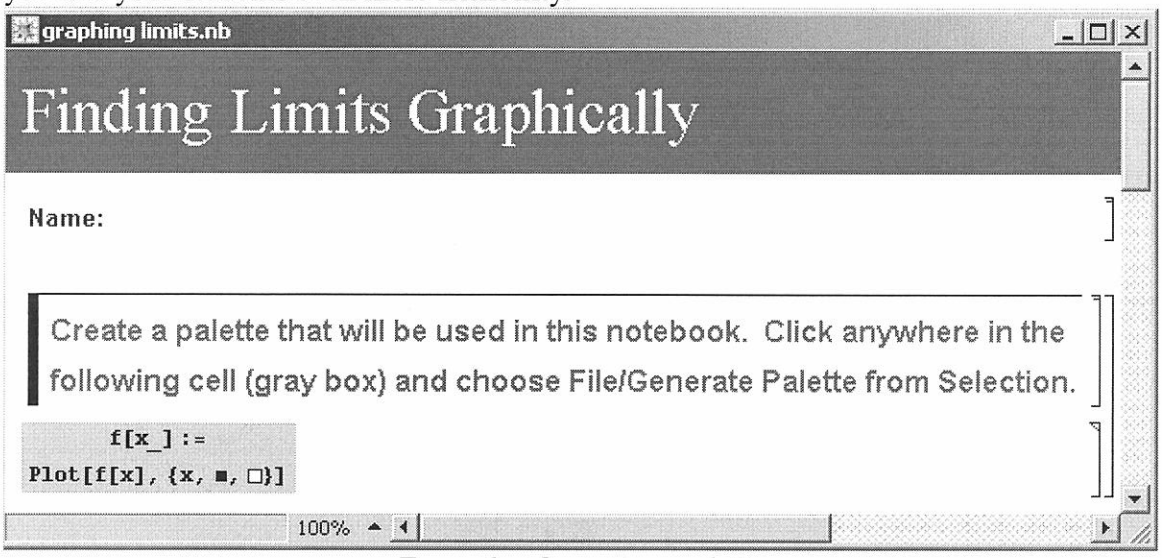
Mathematica is a sophisticated computer algebra package and computer language that can be a great tool for use in the classroom. However, the package can be difficult for students to learn and use. A lot of classroom time can be taken up teaching students correct syntax and helping them find errors. By designing Mathematica notebooks to be more user friendly, much of that time can be eliminated. It is important to design notebooks that are easy for students to use and understand. Several techniques can be used to make Mathematica easier for the average to student to use.

Palettes

Using palettes (menus of mathematical commands) is one way to make notebooks easier for students to use. These palettes provide a menu that allows students to click on the command that they want to use. This eliminates the students need to type in the command correctly. Mathematica has several built-in palettes that can be used very successfully. However, you can design your own palettes (see Figure 1) that will give you and your students even more flexibility.

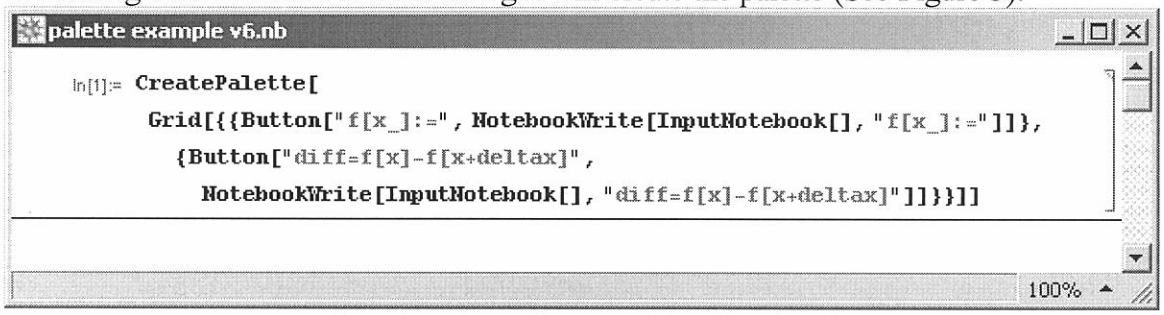


Example of a custom palette
Figure 1

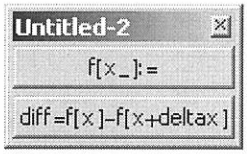
To design your own palette is extremely easy if you are using Mathematica 5. First, you select "Create table/matrix/palette" from the Input Menu. At this point you can choose

how you want the palette to look (style options). Next, you can put in the commands that you want students to be able to use. Wherever a student needs to put in information, you need to create an input box. You can create input boxes by using the following set of commands. Hit the esc key and then type spl and then hit the esc key again. A black box will appear where the information needs to be entered. Once your palette is created, you can save the Mathematica notebook. When a student opens the notebook, they should select the cell containing the palette. Then they need to click on "Generate Palette from Selection" which is located on the file menu. The palette will appear and they can use the commands through out the notebook.

Unfortunately, if you are using Mathematica 6, the process has become far more difficult. It can still be accomplished, but with a little more difficulty. To create a palette, you now must type the following command (see Figure 2): CreatePalette[Grid[{{Button["expr1",NotebookWrite[InputNotebook[],"expr1"]]},{Button[...}]]. The "expr1" is replaced by the Mathematica command that you want in the palette. You can use as many Button commands as you need. Now selecting the cell containing this command and executing it will create the palette (See Figure 3).



Sample Palette Command for Version 6
Figure 2

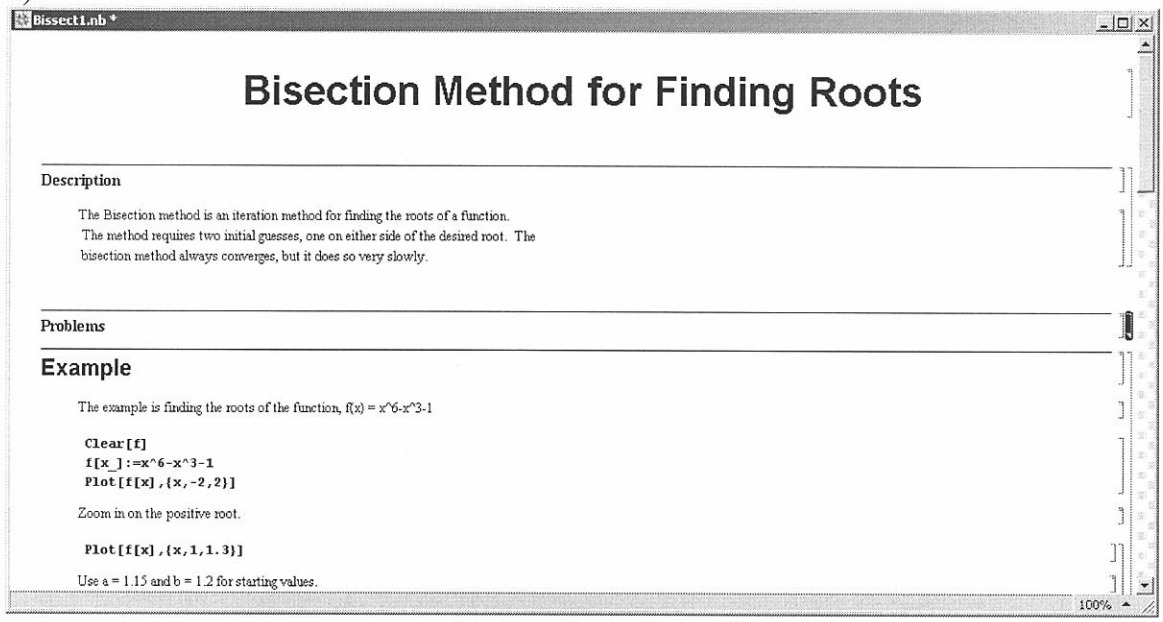


Palette Created using Above Command
Figure 3

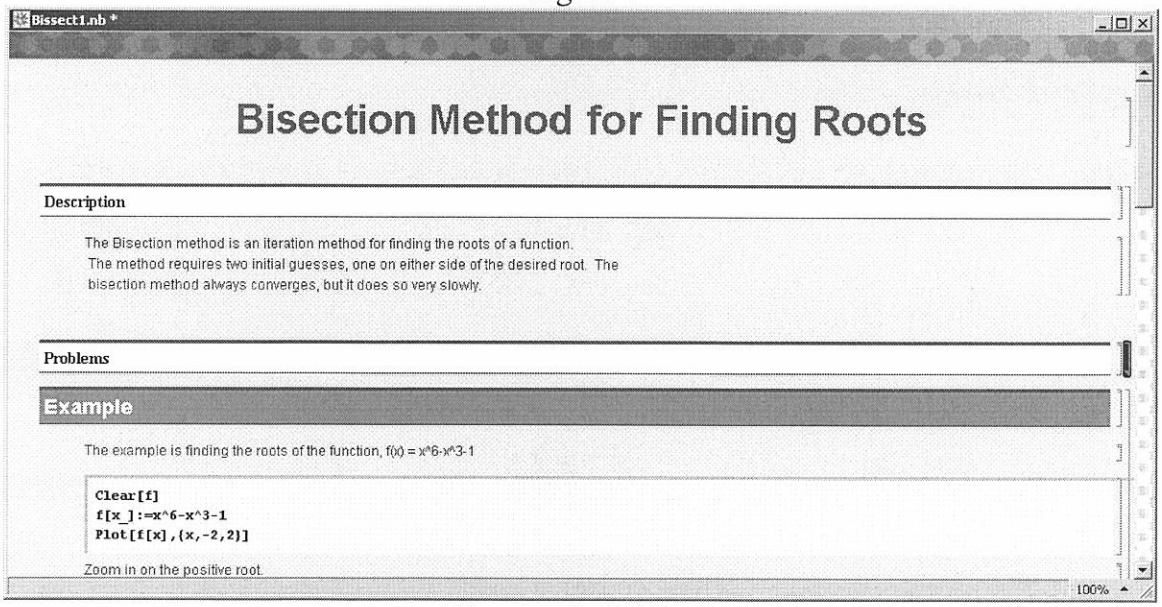
There are many advantages to using custom designed palettes. These advantages include the fact that students do not have to type in most of the commands used. Thus they avoid mistakes such as misspelling, wrong capitalization, etc. They also are aware of what commands will typically be used in any given notebook. Otherwise, the number of commands available is huge and many students may not be able to choose the correct ones. Another advantage is that students feel it is easier for them to concentrate on the mathematics be used and not the commands. The hope is that more actual mathematics can be studied and understood by students using easier Mathematica notebooks.

Style Sheets

Many times when using the Mathematica notebooks it is easy to just use the default style sheet. The problem with the default style sheet is that it is hard to read and understand for the novice. All of the text, commands, etc. look basically the same (see Figure 4). Students will tend to skip executable sections, because they don't notice them intermixed with the text in the notebook. Style sheets use color to set off the executable statements and it is far more obvious what is text and what is an executable command (See Figure 5).



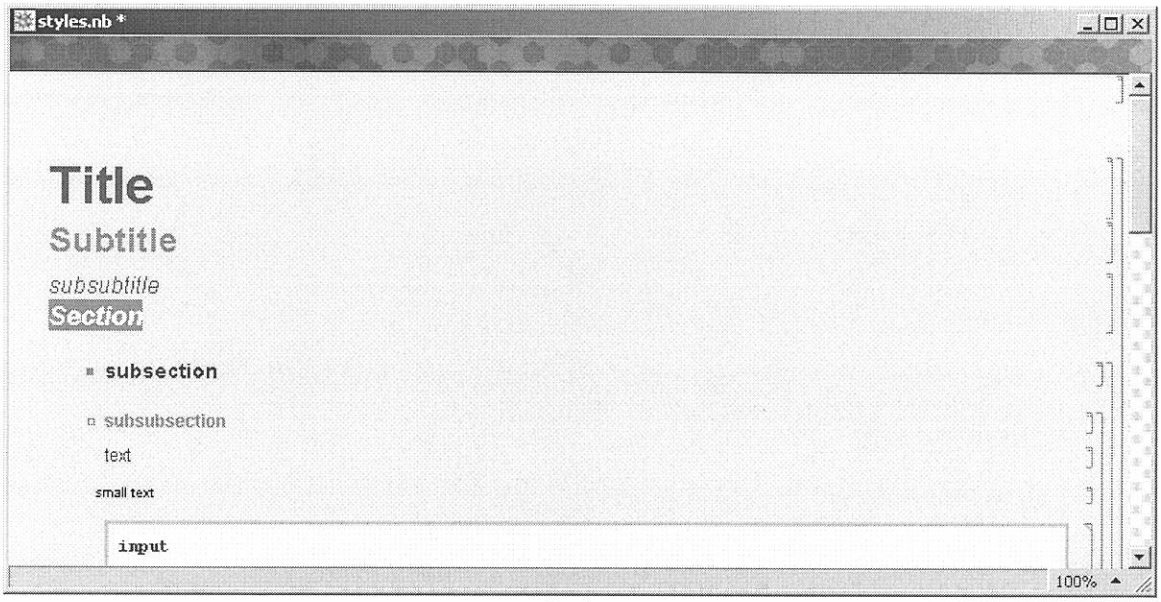
Default Style Sheet
Figure 4



Creative Style Sheet
Figure 5

There are many style sheets to choose from and it is easy to alter existing notebooks by applying a new style sheet. To apply a new style sheet, you can click on the Format Menu and choose Stylesheet. A selection of style sheets is available from Mathematica. You can actually create your own if you do not find any of the built-in ones sufficient or appealing. If you are using Mathematica 5, you actually have access to many different selections that are not available in version 6. In version 6, one of the best is the creative stylesheet.

Not only is it a good idea to use a style sheet, but you should also use styles while creating your notebook. You can opt for titles, subtitles, sections, subsections, text, input, etc. An example of the many styles available is seen in Figure 6. Using the different styles really makes the Mathematica notebook look professional and easy to read. Students will be able to use the notebook easily and recognize the executable sections with simply a glance.



Styles
Figure 6

Conclusion

Mathematica notebooks designed for classroom use can greatly expand students' understanding of mathematics. More difficult problems can be examined and real applications can be solved. Students usually improve their understanding of how mathematics can be used to solve problems as well as their visualization skills. If students do not have to worry about the syntax, they are free to experience the mathematics instead. The primary goal of most Mathematica notebooks that I use is to introduce students to applied problems. Calculus applications such as Boyle's Law relating pressure and volume, optimization of packaging, projectile motion, Newton's Law of Cooling, orbits of comets, and predator/prey relationships can be thoroughly studied.

When designing Mathematica notebooks for classroom use it is important to consider making them easy for students to use. By using custom palettes, styles, and style sheets, you can design notebooks that not only look good, but are easy for students to use. The Mathematics being studied will take center stage and not the syntax of Mathematica. Students who are novice users of Mathematica are able to use it easily if some simple styling and palettes are included in the notebook design.

Students at all levels of mathematics ability can benefit from using Mathematica notebooks in their classes. Students in Calculus are usually introduced to Mathematica and we continue to use it throughout their advanced college courses. Students have been able to successfully navigate these notebooks and gain an additional understanding of mathematical applications. We have been able to study complex problems and relieve the tedium of calculations that would typically be beyond their abilities.